Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ON THE CAUSE OF DETERIORATION IN SOME OF OUR NATIVE GRAPE-VINES, AND ONE OF THE PROBABLE REASONS WHY EUROPEAN VINES HAVE SO GENERALLY FAILED WITH US.

[Concluded from page 544.]

BY C. V. RILEY.

Means of Contagion from one Vine to Another.— The young lice, whether hatched upon the roots or in the galls, are quite active and crawl about for some time; and that they will spread from one vine to another, either under ground upon the roots or on the surface of the ground during the night, is highly probable. Such, however, cannot be the mode of spreading from one vineyard to another; for were it so, the malady could not possibly have assumed such proportions in so short a time as it has done abroad. One method of transport is upon the roots of seedlings and cuttings, but the insect cannot in this manner find its way to an old vineyard, and there must be still another means. Here we come to that part of the natural history of our louse which must assume the form of hypothesis until further observations shall be made. In this country the malady is general, but in France, where it is still spreading from one place to another, they have a good opportunity to watch its progress; and Planchon finds that it always commences at certain circumscribed points and spreads from these points in more or less regular circles. There is no way of accounting for these nuclei—these starting points in the centre of an old vineyard that never showed signs of the disease before, except on the hypothesis of the winged insect having flown there and started the colony.

We have already seen that certain individuals of the root-inhabiting type become winged. Why these individuals become winged while others never do, is, perhaps, not for us to understand. Signoret ventures the Lamarckian suggestion that the need of quitting roots that are already destroyed may be one reason, and the pupæ are certainly found more particularly on badly infested roots. All plant-lice multiply agamically during the summer months while they are abundantly nourished, but towards winter when, by this mode of reproduction, and by the diminishing nutriment in the dying foliage, the lice become, so to speak, exhausted, then lo and behold winged males and females appear! Numerous other facts in insect life such as the production of drone bees solely from unfertilized eggs, etc., indicate that the winged male may be, in some way or other, connected with defective vitality; and Mr. Thomas Meehan, of the "Gardener's Monthly," has so frequently observed such to be the case with plants, that he considers it a law "that with a weakened vitality comes an increased power to bear male flowers."* But this throws no light on the production of winged females, and here, as in thousands of other instances, nature tells us plainly to be satisfied with the facts without the explanation.

Our winged female is a reality! What, then are her functions? In the breeding jars she invariably flies towards the greatest light, and her large compound eyes, and ample wings indicate that she was made for the light and the air. We have also seen that she is burdened with two or three eggs only, and my opinion is that after meeting her mate, her sole life duty is to fly off and consign her few eggs to some grape-vine or grape-bud, and that the lice hatching from these eggs constitute the first gall-producing mothers.

I am led to this opinion by the fact that about the middle of May, in looking for the galls, I always find but two or three to a vine, and generally but one to a leaf. These vernal galls, as one would expect from the greater vitality of the young from fertilized eggs, and the greater succulency of the leaves at that season are much larger than the ordinary summer form, and generally have a decided rosy tint on one side. Similar galls have also been found in France. Just as many other insects prefer certain species of plants, or even certain varieties of a species, so our winged *Phylloxera* shows her preference for the Clinton and its close allies. She occasionally deposits her eggs on other varieties, as I have found the large vernal galls on Concord, Hartford Prolific, etc., and it follows that she must do so where no *riparia* vines occur. But, except on the varieties of the latter species, the young lice hatching from her eggs do not seem to be capable of forming galls on the leaves, but make straightway for the roots.

---

*Proc. Am. Ass. Adv. Sci., 1869, p. 256.

Only in this manner can we account for the galls abounding so much more on some varieties than on others.

Some persons may wonder how a minute insect with such delicate wings, braced with so few simple veins, as those possessed by our *Phylloxera* can manage to fly through the air to any great distance; and those who have not witnessed them in flight are very apt to underrate their powers of volitation. There is a conical gall very common on the upper surface of the leaves of our Shell-bark hickories. This gall is made by a louse very closely allied to our Grape-leaf gall-louse and was named *Phylloxera caryæfoliæ* by Dr. Fitch.* This louse occurs abundantly in the winged form, and furnishes an excellent illustration of the power of the insects of this genus to fly. Let any one watch these winged gall-lice, as they issue, during some warm day in June, from the fimbriated mouth of their gall, and he will be struck with astonishment at the facility and power with which they fly off. They are no sooner out of the gall than the wings begin to vibrate so as to become invisible, and the insect suddenly darts away with wonderful force. They must likewise often be carried great distances by the wind.

Again, it would at first sight seem almost impossible for the female to deposit her loose eggs which have no viscous property, upon a swaying leaf, but this very feat is accomplished by another little louse of the same genus,† which may be found depositing its eggs all through the summer months, on the under side of the leaves of our young Post oaks.

PROBABLE REASON WHY ITS INJURIES ARE GREATER IN EUROPE THAN WITH US.—It is a well recognized fact among careful observers, that in the natural state there is a greater harmony between the fauna and flora of a country than in the more artificial state that civilized man induces by cultivation. Through a long series of ages, the species least able to contend in the struggle for life "go to the wall," until at last by a process of elimination, the balance is struck and we find the animal and plant world well adapted and adjusted to each other. For this reason the native vines which now flourish in this country are those which have fought the long battle in the past and have best resisted the enemy. They are, in short, best adapted to the circumstances, and by their more vigorous nature resist the hypertrophy of the bark caused by the punctures of the lice, and form new bark under it. The European vines, on the contrary, are not only of a more highly improved and tender character, but have not been accustomed to the disease. They consequently succumb more readily, on the same principle that many diseases that are comparatively harmless among civilized nations, acquire greater virulency and play fearful havoc when introduced among savage or hitherto uncontaminated peoples.

---

*Rep. III. § 166.

† This is a species of *Phylloxera*, which is yet undescribed but which M. J. Lichtenstein proposes to call *Ph. Rileyi*. It infests the leaves of our Post oak very much in the same manner as the European *Ph. quercus* infests their oaks—causing a similarly pale speckled appearance of the upper side of the leaves. It differs from all described species in the great length and prominence of the tubercles.

There may be other reasons such as the different modes of culture and differences of soil; for in the French districts, so badly affected, the vines are either grown with a single stake or no stake at all, and their soil is generally much poorer than ours. In America, also, we know that there are several natural enemies of the louse, and these checks have, in all likelihood, never been imported into Europe with their prey. That the louse will in time find enemies and lose its acute power of doing harm even in Europe, is highly probable; and M. Planchon has already noticed that the infested vines in the latter invaded departments of Gard and Herault retained a comparatively greener color than in that of Vaucluse, first invaded. Such has been the history of the Hessian fly and a number of other insects imported into this country. These are the explanations I venture, and whether they be generally accepted or not, the facts remain.

OUTWARD AND MORE VISIBLE EFFECTS OF THE ROOT DISEASE.— As long as the lice are confined to the more fibrous roots which, in a measure, are renewed each year, the vines show no decided outward signs of the malady, which may then be considered in its incipient stage. As they become multiplied and fasten on to the larger roots, their work becomes more visible in a sickly, yellowish appearance of the leaf; and a reduced growth of the vine is the result. As the roots waste away, these symptoms become more acute, and at this stage of the disease the lice have generally left, so that when the vine is about dying it is often difficult to find any trace of the cause of death. On the rotten roots little eight-legged mites are frequently met with, and they are also to be found in the galls. They may always be distinguished from the true lice by their white, or dirty-white, color.

Practical Suggestions.—Last year, from the knowledge we then had of this insect in this country I recommended the destruction of the Clinton vine, where other and better varieties succeeded as well. This advice was given in order to get rid of the galls, and wherever it has been followed it has had the desired effect. It was given, however, under the impression that the lice would not attack the roots except where the leaves were covered with galls; whereas, in truth, the roots would appear to be less affected (at least during the growing season) where the leaf-galls are abundant than where they are scarce; while they may be absolutely ruined where no signs of galls exist. Consequently there is no longer any urgent need of, or good reasons for, destroying our Clinton vines. By doing so we may diminish the number of galls, but we can never exterminate the root-lice. Future experiments will no doubt show that good results will attend the grafting of such varieties as are known to be most seriously affected, on to the roots of less susceptible varieties.

The insect should be especially watched, as it is apt to be most troublesome, on poor, gravelly or clayey soils. In deep, rich soils I think there is less danger. In France it has been found to be less troublesome on sandy soils, and in my studies I have always noticed that minute, soft-bodied insects do poorly in sand.* The greater the growth of vine the greater the growth of root, and consequently vines that are trained on walls and which thus more nearly approach the wild state, or which are rendered vigorous by a rich soil, are least susceptible to the disease.

Remedies.— *Destruction of the Gall-Lice.*— From what we have seen, we may justly infer that this insect cannot of itself spread from one vineyard to another without going through the gall-producing phase: and a few galls on the leaves are, no doubt, invariably the first signs of its advent, by natural means, into a vineyard not previously attacked. By natural means, I mean without the aid of man's assistance, by which they are introduced from one place to another on the roots. If these galls, therefore, could only be found and destroyed, it would be one way of effectually heading off the evil; and in a new vineyard a little vigilance in searching for these galls might save much subsequent loss and labor. I shall not treat here of the natural enemies of the louse, which are of such a nature that they cannot be practically controlled and increased.

---

* In examining the vine roots this fall in some parts of Northern Illinois, where sand formed a prominent portion of the soil, I found very few root-lice; except on *riparia* vines whose leaves had been covered with galls. Even on these the general healthfulness of the roots indicated that they had not been infested during the summer, and that the lice had all come from the last galls of the season.

Destruction of the Root-Lice.—I hope next spring to institute a series of experiments on the root-lice, with a view to the discovery of a practical remedy. It were to be desired that others having opportunity and occasion would do likewise. Here is an excellent chance for our different agricultural colleges, which have greater means and facilities than any one individual can possibly have. As a guide to such experiments, and to profit as much as possible by the experience of others, I will synopsize the results of trials in France. From these results, which I give below, we may learn that no reliable and cheap remedy, that will destroy all the lice after they have become numerous, has yet been discovered; and the best advice that can at present be given is to guard against the insect's introduction into new vineyards by carefully examining the roots before planting. If knots and lice are found upon them the latter may be destroyed by the same means used against the Apple root-lice—*i. e.*, by immersing the roots in hot soap-suds or tobacco-water.

Preparations of carbolic acid have, so far, given most satisfaction, and I have great hopes of benefit from the saponaceous compound prepared in this country by James Buchan & Co., of New York. This compound is not yet manufactured in France, where they have to use the pure acid or the crystals.

Carbolic acid added to water at the rate of one-half to one per cent. has been successfully employed, and M. Leenhardt, of Sorgues, has by its use, succeeded in keeping his vineyard alive and bearing, while all those around him are destroyed. He uses a heavy bar, thickened and pointed at the end, wherewith to make two or three holes, a foot or more deep, around the base of each vine. He then fills these holes with the liquid, which gradually permeates the soil in all directions. A good post-hole auger, such as we use in this country, would work more rapidly, with the advantage of compressing the earth less, but it would do more injury to the roots.

Oil of Cade.—This empyreumatical oil, which is common and cheap in France, when dissolved in any alkali (the urine of cows being good enough) and applied in the same manner described above, has also given good results. A mixture composed of lime and sulphur boiled in water at the rate of about five pounds lime and five pounds sulphur to one gallon of water, and applied when hot, has been found good.

Alkalies seem to invigorate the vines, but do not affect the lice. They are also too costly. *Salt.*—Vines on lands strongly impregnated with salt have been found to resist the attacks of the lice. *Acids* generally are neutralized by the lime which most soils contain.

Sulphur has been thoroughly tried without any good results, either upon the leaf-lice or root-lice.

Sulphuretted hydrogen.—They have tried to pump this into the soil, but the pumps always break and no one would think of going to such trouble here.

Sulphate of Iron is of no account. *Sulphate of Copper* destroys the roots. Numerous other chemicals have been experimented with, but with very little or no success, and they are besides not applicable on a large scale.

Irrigation and *Submersion* have been pretty thoroughly tested, and it is doubtful, even where they can be employed, whether they have any other effect than that of invigorating the vines, as the lice are, many of them, found alive after a submergence of months. These methods must be considered conservatives rather than curatives.

RÉSUMÉ OF THE INSECT'S HISTORY.—We have had in this country, from time immemorial, an insect attacking our native vines, either forming galls on the leaves or gall-like excrescences on the roots.* This insect is polymorphic, as many others of its family are known to be. It also exists in two types, the one, which may be termed *radicicola*, living on the roots, while the other, which may be termed *gallœcola*, dwells in galls on the leaves. The latter is found more especially on the Clinton and its allies, while the former is found on all varieties, but flourishes best on vines belonging to the *vinifera* species. The gall-inhabiting type was noticed and imperfectly described in 1856, but the root-inhabiting type, being less conspicuous, was unknown in this country till last year.

---

* I have been able to trace them with absolute certainty as far back as 1845, for in the herbarium of Dr. Engelmann is a specimen of wild *riparia* gathered in this State in that year, the leaves of which are disfigured by the very same gall.

Such an insect is very readily transported from one country to another on grape roots, seedlings, etc., and just as our Apple, root-louse (*Eriosoma lanigera* Hausm.) was imported into Europe towards the close of the last century, so we find that our Grape-louse was similarly imported, in all probability within the last decade. The mode of transport will become all the more intelligible when I state that M. Signoret showed me, last July, the yet living progeny of some lice which he had placed in a tightly-corked glass tube the year before; and that he had managed to keep a few alive for study through the siege of Paris up to the time mentioned.

Nothing would be more natural than its introduction at Bordeaux, where M. Laliman has, for a number of years, been assiduous in the cultivation and trial of our different American vines. Or it might have been introduced at the nurseries of the Audebert Bros., near Tarascon,* where all sorts of American plants have been cultivated; and, if I mistake not, M. Planchon with commendable zeal, has so thoroughly sifted the history of the subject in France that he can trace the first invasion, with tolerable certainty, to a point near this place, Tarascon. It doubtless existed in France a few years before its injuries attracted attention, and the first notice of its work was made in the vineyard of M. de Penarvan, at Ville-neuve-les-Avignon, in 1863. The scourge soon increased and spread, and in 1868 and 1869 acquired such dimensions as thoroughly to alarm the great grape-growing districts of beautiful France. At first all sorts of hypotheses were put forth as to its cause. Some book-worms even thought they had found in this root-louse the *Phtheir* of the ancient Greeks, but the intelligent labors of M. Planchon dispelled all such illusions, and and pr̂oved that the *Phtheir* of the ancients was a true bark-louse (*Dactylopius longispinus* Targ.) of a totally different nature and still existing in the Crimea.†

---

*M. Laliman, in the essay already mentioned (p. 63), shows that this nursery has not existed for nearly fifteen years; but this fact does not preclude the possibility of the louse having been first introduced there. It would only indicate, if the spread of the disease can be traced from that point, that it existed in France, without attracting attention, at an earlier epoch than is generally supposed.

†See an Essay entitled La Phthiriose on Pédiculaire de la Vigne chez les Anciens. Bulletin de la Soc. des Agr. de France, July, 1870.

In this manner our root-louse was known and studied in a foreign land before its presence was even suspected in this — its native country.

CONCLUSION — NO NEED OF UNNECESSARY ALARM.— Knowledge of the facts I have here brought forth need not alarm the grape-grower any more than correct knowledge of some indisposition, hitherto incomprehensive and consequently uncured, should alarm the human patient. It was only a few years ago that our eyes were opened to the true character of the entozoon known as *Trichina spiralis*, and there can be little doubt but that previous to our knowledge of this parasite many a death occasioned by it was attributed to other unknown causes. It may not be more easy to cure the disease now than it was formerly, but we are, by understanding its nature, enabled easily to guard against and prevent it. " Full knowledge of the truth," says Helmholz, " always brings with it the cure for the damage which imperfect knowledge may occasion." The Phylloxera has always existed on our vines, and those varieties which in the past have best withstood its attacks will be very likely to do so in the future. The presence of a few lice on such varieties need cause no fear, for the idea of ever entirely exterminating such an insect from the country must be perfectly utopian, and all we can do is to watch and more particularly care for those varieties that most easily succumb. In the future, the vineyardist will be enabled, by the revelations here made, to trace to a definite cause many a failure which has hitherto been wrapped in conjecture and mystery.

In thus calling the attention of the grape growing community to this interesting little insect, which is sapping the roots of their vines, my intention is to do good and not cause unnecessary consternation. Let me hope that others may be induced to study the microscopic plague and thus not only assist to fill the gaps yet occurring in its natural history, but help us to become better masters of it. Only those who have witnessed the fearful havoc it has made abroad, where in three years it caused a loss of 25,000,000 francs in the single department of Vaucluse, France, can fully appreciate its importance and its power, under favorable circumstances, to do harm.

I must remind those who live outside of Missouri, that my observations in this country have been confined to different parts of this State and apply more especially to this portion of the

Mississippi Valley. The insect occurs, however, very generally over the country east of the Mississippi river, even into Canada; and there are strong indications that it produces similarly injurious effects elsewhere. To give a single example:—according to the records, most of the vineyards on Staten Island which were flourishing in 1861, and which were composed principally of Catawba, had failed in 1866, and Mr. G. E. Meissner, of Bushberg, who then owned a vineyard on that island, informs me that he had noticed the nodosities, and that the roots of the dying vines had wasted away.* I cannot conclude without publicly expressing my indebtedness to Messrs. Lichtenstein and Planchon, of Montpellier, France, for the cordial and generous manner in which they gave me every facility for studying the insect there, and witnessing experiments in the field.

REVIEWS AND BOOK NOTICES.

Recent Discoveries in Ornithotomy.—The authors' courtesy places two very notable papers on our table. I. Prof. Morse's embryological studies † have furnished one of the most important contributions ever offered in this country to our knowledge of the structure and development of birds. His entirely original researches, conducted with scrupulous care, in the most candid spirit, not only confirm the late determinations of Gegenbaur and other European anatomists, but take a long step beyond. We have from time to time been apprised of the author's progress in the investigation, and since its close have given the subject the closest scrutiny. In stating the points we believe that the author has established, we must also indicate those that we hold to be still questionable.

Prof. Morse finds four tarsal bones. Three of these have been very generally recognized of late, although rejected or at most not

---

* Since the above was written, I have listened to an essay on Grapes, by Mr. P. Manny, of Freeport, Stephenson county, Illinois. In this essay, which was read before the Illinois State Horticultural Society, the writer states that his Delaware, Iowa and Salem vines lose their lower roots. He attributes this loss of roots to the tenacity of the soil (though more likely owing to unseen root-lice) and has remedied it in a measure by grafting on Clinton roots.

† *On the Carpus and Tarsus of Birds.* By Edward S. Morse, Ph.D. Ann. Lyc. Nat. Hist., N. Y., X, 1872.